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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/881,489	06/14/2001	Gerhard Beckmann	107044-0011	7907

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EXAMINER	
YUAN, DAH WEI D	

ART UNIT	PAPER NUMBER
1745	11

DATE MAILED: 10/14/2003

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	09/881,489	BECKMANN ET AL.	
	Examiner	Art Unit	
	Dah-Wei D. Yuan	1745	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *11 June 2003* .

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1,3-8 and 15-32* is/are pending in the application.

4a) Of the above claim(s) *21-31* is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☐ Claim(s) *1,3,4,6,7,15-17,19,32* is/are rejected.

7)☒ Claim(s) *5,8,18 and 20* is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

11)☐ The proposed drawing correction filed on _____ is: a)☐ approved b)☐ disapproved by the Examiner.

If approved, corrected drawings are required in reply to this Office action.

12)☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

13)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____ .

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

14)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).

a) ☐ The translation of the foreign language provisional application has been received.

15)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

1) ☐ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO-1449) Paper No(s) _____ .
4) ☐ Interview Summary (PTO-413) Paper No(s). _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: .

APPARATUS AND METHOD FOR RAPIDLY INCREASING POWER OUTPUT FROM A DIRECT OXIDATION FUEL CELL

Examiner: Yuan S.N. 09/881,489 Art Unit: 1745 October 8, 2003

Detailed Action

1. The Applicant's amendment filed on June 11, 2003 was received. Claim 4 was amended. Claims 20-32 were added.

2. The text of those sections of Title 35, U.S.C. code not included in this action can be found in the prior Office Action (Paper No. 9).

Election/Restrictions

3. Newly submitted claims 21-31 directed to an invention that is independent or distinct from the invention originally claimed for the following reasons: Claims 21-31 and claims 1,3-8,15-20,32 are related as process and apparatus for its practice. The inventions are distinct if it can be shown that either: (1) the process as claimed can be practiced by another materially different apparatus or by hand, or (2) the apparatus as claimed can be used to practice another and materially different process. (MPEP § 806.05(e)). As admitted by the Applicant, the method of operating a direct oxidation fuel cell can be practiced on two distinct fuel cell systems as stated in claims 1 and 32, respectively.

Since applicant has received an action on the merits for the originally presented invention, this invention has been constructively elected by original presentation for prosecution

on the merits. Accordingly, claims 21-31 are withdrawn from consideration as being directed to a non-elected invention. See 37 CFR 1.142(b) and MPEP § 821.03.

Claim Objection

4. The claim objections on claim 4 are withdrawn, because the claim has been amended.

Claim Rejections - 35 USC § 102

5. The claim rejections under 35 U.S.C.102(e) on claims 1,19 are maintained. The rejection is repeated below for convenience.

With respect to claim 1, Surampudi et al. teach a direct methanol fuel cell system comprising a direct methanol fuel cell sack (25), a source of pure (neat) methanol (900), a conduit coupled to a methanol source (900) and to a valve (904) for delivering the methanol to an anode in the fuel cell stack. See Figures 2 and 9. The fuel cell stack comprises an anode biplate (304) (i.e., anode in the instant specification), a cathode biplate (315) (i.e., cathode in the instant specification) and a membrane electrode assembly (MEA) (318). See Figure 5. The MEA comprises an anode (14) (i.e., anode diffusion layer in the instant specification), a cathode (16) (i.e., cathode diffusion layer in the instant specification) and a membrane (18). See Figure 1. The membrane is a copolymer of tetrafluoroethylene and perfluorovinylether sulfonic acid and is proton-conducting. The cathode has platinum (catalyst) bonded to a first side of the membrane (18). The anode has platinum-ruthenium alloy particles bonded to a second side of the membrane. The direct methanol fuel cell system further comprises a controller (914) coupled

to valves (904,912) wherein the controller controls the relative positions of the valves. See Figure 9. Furthermore, the controller is used to control the operation of the direct methanol fuel cell system of a vehicle by a methanol sensor, which detects the concentration of methanol in the circulation tank. Therefore, the controller is responsive to the motion of the vehicle by interacting with the methanol sensor. This is further supported by the fact that excess water, which results from higher power output, is discharged through a vent (954), which is also controlled by the controller. See Column 4, Lines 5-45; Column 6, Lines 15-39; Column 15, Lines 15-43; Column 17, Line 66 to Column 18, Line 53.

With respect to claim 19, the direct methanol fuel cell system further comprises a pump (902) coupled to the methanol source (900) and the anode biplate (304), which comprises an anode flow field plat (314). See Figures 2 and 9; Column 15, Lines 36-39.

6. Claim 32 is rejected under 35 U.S.C. 102(e) as being anticipated by Surampudi et al. (US 6,265093 B1).

Surampudi et al. teach a direct methanol fuel cell system comprising a direct methanol fuel cell sack (25), a source of pure (neat) methanol (900), a conduit coupled to a methanol source (900) and to a valve (904) for delivering the methanol to an anode in the fuel cell stack. See Figures 2 and 9. The fuel cell stack comprises an anode biplate (304) (i.e., anode in the instant specification), a cathode biplate (315) (i.e., cathode in the instant specification) and a membrane electrode assembly (MEA) (318). See Figure 5. The MEA comprises an anode (14) (i.e., anode diffusion layer in the instant specification), a cathode (16) (i.e., cathode diffusion

layer in the instant specification) and a membrane (18). See Figure 1. The membrane is a copolymer of tetrafluoroethylene and perfluorovinylether sulfonic acid and is proton-conducting. The cathode has platinum (catalyst) bonded to a first side of the membrane (18). The anode has platinum-ruthenium alloy particles bonded to a second side of the membrane. Pure methanol (or other methanol-type derivative fuel, such as trimethoxymethane) is used as a source of highly concentrated carbonaceous fuel substance. The direct methanol fuel cell system further comprises a controller (914) coupled to valves (904,912) wherein the controller controls the relative positions of the valves. See Figure 9. Furthermore, the controller is used to control the operation of the direct methanol fuel cell system of a vehicle by a methanol sensor, which detects the concentration of methanol in the circulation tank. Therefore, the controller is responsive to the motion of the vehicle by interacting with the methanol sensor. This is further supported by the fact that excess water, which results from higher power output, is discharged through a vent (954), which is also controlled by the controller. See Column 3, Lines 20-22; Column 4, Lines 5-45; Column 6, Lines 15-39; Column 15, Lines 15-43; Column 17, Line 66 to Column 18, Line 53.

Claim Rejections - 35 USC § 103

7. The claim rejections under 35 U.S.C.103(a) as being unpatentable over Surampudi et al. and Sugita et al. on claims 3,4 are maintained. The rejection is repeated below for convenience.

With respect to claim 3, Surampudi et al. teach a direct oxidation fuel cell comprising a membrane electrode assembly, which is composed of an anode (14) (i.e., anode diffusion layer in

the instant specification), a cathode (16) (i.e., cathode diffusion layer in the instant specification) and a membrane (18). Pure methanol is mixed with water to be used as fuel in the fuel cell stack. See Figure 1, Column 4, Lines 5-16; Column 17 Line 66 to Column 18, Line 7. Surampudi et al. do not teach the electrode diffusion layers having one or more apertures extending from a first surface to a second surface. Sugita et al. teach a fuel cell system comprising a membrane (18), an anode catalyst layer (50), a cathode catalyst layer (54), an anode diffusion layer (102) and a cathode diffusion layer (104). See Figure 6. The anode diffusion layer has a plurality of holes (110), which are formed through the anode gas diffusion layer (102) corresponding to the lands (14c) of the separator (14). The holes are used to transport the fuel to the electrode catalyst layer (50) and the solid polymer ion exchange membrane (18). As a result, the effective reaction area of the anode and cathode catalyst layers is increased. See Column 2, Lines 39-47; Column 6, Lines 5-23. Therefore, it would have been obvious to one of ordinary skill in the art to have one or more apertures extending through the anode diffusion layer on the direct methanol fuel cell system of Surampudi et al., because Sugita et al. teach the incorporation of conduits extending through the anode diffusion layer can increase the effective reaction area of the anode electrode catalyst layer and thus, improve the efficiency of the fuel cell system. The recitation "for use in a direct oxidation fuel cell" is considered as an integral limitation of the claim because of the significance of the fuel requirement.

With respect to claim 4, the gas diffusion layer of Surampudi et al. are connected to a methanol tank (900) via a conduit (918) and a valve (904). See Figure 9, Column 17, Line 66 to Column 18, Line 21. Therefore, it would have been obvious to one of ordinary skill in the art to

have one or more apertures extending through the anode diffusion layer on the membrane electrode assembly of Surampudi et al., because Sugita et al. teach the incorporation of conduits extending through the anode diffusion layer can increase the effective reaction area of the anode electrode catalyst layer and thus, improve the efficiency of the fuel cell system.

8. The claim rejections under 35 U.S.C. 103(a) as unpatentable over Surampudi et al. and Sugita et al. on claims 6,7 are maintained. The rejection is repeated below for convenience.

With respect to claim 6, Surampudi et al. teach a direct oxidation fuel cell comprising a membrane electrode assembly, which is composed of an anode (14) (i.e., anode diffusion layer in the instant specification), a cathode (16) (i.e., cathode diffusion layer in the instant specification) and a membrane (18). Pure methanol is mixed with water to be used as fuel in the fuel cell. The membrane is a copolymer of tetrafluoroethylene and perfluorovinylether sulfonic acid and is proton-conducting. The cathode has platinum (catalyst) bonded to a first side of the membrane (18). The anode has platinum-ruthenium alloy particles bonded to a second side of the membrane. See Figure 1, Column 4, Lines 5-16; Column 6, Lines 15-17; Column 17 Line 66 to Column 18, Line 7. Surampudi et al. do not teach the electrode diffusion layers having one or more apertures extending from a first surface to a second surface. Sugita et al. teach a fuel cell system comprising a membrane (18), an anode catalyst layer (50), a cathode catalyst layer (54), an anode diffusion layer (102) and a cathode diffusion layer (104). See Figure 6. The anode diffusion layer has a plurality of holes (110) which are formed through the anode gas diffusion layer (102) corresponding to the lands (14c) of the separator (14). The holes are used to

transport the fuel to the electrode catalyst layer (50) and the solid polymer ion exchange membrane (18). As a result, the effective reaction area of the anode and cathode catalyst layers is increased. See Column 2, Lines 39-47; Column 6, Lines 5-23. Therefore, it would have been obvious to one of ordinary skill in the art to have one or more apertures extending through the anode diffusion layer on the direct methanol fuel cell system of Surampudi et al., because Sugita et al. teach the incorporation of conduits extending into and through the anode diffusion layer can increase the effective reaction area of the anode electrode catalyst layer and thus, improve the efficiency of the fuel cell system. The recitation "for use with a direct oxidation fuel cell" is considered as an integral limitation of the claim because of the significance of the fuel requirement.

With respect to claim 7, the gas diffusion layer of Surampudi et al. are connected to a methanol tank (900) via a conduit (918) and a valve (904). See Figure 9, Column 17, Line 66 to Column 18, Line 21. Therefore, it would have been obvious to one of ordinary skill in the art to have one or more apertures extending through the anode diffusion layer on the membrane electrode assembly of Surampudi et al., because Sugita et al. teach the incorporation of conduits extending through the anode diffusion layer can increase the effective reaction area of the anode electrode catalyst layer and thus, improve the efficiency of the fuel cell system.

9. The claim rejections under 35 U.S.C. 103(a) as unpatentable over Surampudi et al. and Sugita et al. on claims 15-17 are maintained. The rejection is repeated below for convenience.

With respect to claim 15, Surampudi et al. disclose a direct methanol fuel cell system as described above in Paragraph 4. However, Surampudi et al. do not disclose the presence of conduits extending to a first surface of the anode diffusion layer. Sugita et al. teach a fuel cell system comprising a membrane (18), an anode catalyst layer (50), a cathode catalyst layer (54), an anode diffusion layer (102) and a cathode diffusion layer (104). See Figure 6. The anode diffusion layer has a plurality of holes extending from a first surface to a second surface. Similarly, the cathode diffusion layer has a plurality of holes extending from a first surface to a second surface. As a result, the effective reaction area of the anode and cathode catalyst layers is increase. See Column 6, Lines 5-23. Therefore, it would have been obvious to one of ordinary skill in the art to have at least one of the conduits extending to a first surface (the interface between anode diffusion layer (102) and anode catalyst layer (50) in Figure 6) of the anode diffusion layer on the direct methanol fuel cell system of Surampudi et al., because Sugita et al. teach the incorporation of conduits extending to a first surface of the anode diffusion layer can increase the effective reaction area of the anode electrode catalyst layer and thus, improve the efficiency of the fuel cell system.

With respect to claims 16,17, Sugita et al. teach a fuel cell system comprising a membrane (18), an anode catalyst layer (50), a cathode catalyst layer (54), an anode diffusion layer (102) and a cathode diffusion layer (104). See Figure 6. The anode diffusion layer has a plurality of holes (110), which are formed through the anode gas diffusion layer (102) corresponding to the lands (14c) of the separator (14). As a result, the effective reaction area of the anode and cathode catalyst layers is increased. See Column 6, Lines 5-23. Therefore, it

would have been obvious to one of ordinary skill in the art to have at least one of the conduits extending into as well as through the anode diffusion layer on the direct methanol fuel cell system of Surampudi et al., because Sugita et al. teach the incorporation of conduits extending into and through the anode diffusion layer can increase the effective reaction area of the anode electrode catalyst layer and thus, improve the efficiency of the fuel cell system.

Allowable Subject Matter

10. Claims 5,8,18,20 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims. Claims 5,8 would be allowable because the prior art does not disclose or suggest one or more apertures are lined with a material which is substantially impermeable to the fuel. Claim 18 would be allowable because the prior art does not disclose or suggest the at least one of the conduits extends directly to the protonically-conductive membrane. Claim 20 would be allowable because the prior art does not disclose or suggest the at least one of the conduits extends directly to the catalyzed surface of the protonically-conductive membrane.

Response to Arguments

11. Applicant's arguments filed on June 11, 2003 have been fully considered but they are not persuasive.

Applicant's principle arguments are

(a) Neither Surampudi nor Sugita teaches a responsive fuel cell system to increased demand as recited in the claim;

(b) instant specification does not require the recirculation of methanol as disclosed in the Surampudi reference.

In response to Applicant's arguments, please consider the following comments.

Surampudi reference discloses a direct methanol fuel cell system comprising a controller (914), which controls the overall operation of the entire system. Specifically, controller controls the relative positions of the valves (904,912), which are used to regulate the amount of fuel to be delivered to the fuel cell stack (924) downstream. Also, vent for the excess water (byproduct of the fuel cell reaction) is controlled by the controller, which is an indicative of the interaction between power output and the controller. See Column 18, Lines 5-53;

(b) the recited novelty is not stated in the independent claims.

Conclusion

12. Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO

MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Dah-Wei D. Yuan whose telephone number is (703) 308-0766. The examiner can normally be reached on Monday-Friday (8:00-5:00).

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Patrick J. Ryan, can be reached on (703) 308-2383. The fax phone numbers for the organization where this application or proceeding is assigned are (703) 872-9310 for regular communications and (703) 872-9311 for After Final communications.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is (703) 308-0661.

Dah-Wei D. Yuan
October 9, 2003

Patrick Ryan
Supervisory Patent Examiner
Technology Cent.. 700